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Forest Service

United States Department of Agriculture

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Eastern Redcedar

An American Wood

Eastern redcedar is the most widely distributed tree-sized conifer in the Eastern United States. Its range also extends into southeastern Canada. The wood has a fine, uniform, straight grain and is favored because of its exceptional cutting qualities, durability, rich color, and aroma. Redcedar is often used for Christmas trees and fenceposts, and the lumber, because of its aromatic odor, is used for chests, wardrobes, and closet linings.

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Eastern Redcedar
(*Juniperus virginiana* L.)

Edwin R. Lawson[1]

Distribution

Eastern redcedar is the most widely distributed conifer of tree size in the Eastern United States; it is found in every State east of the 100th meridian (fig. 1). The species also appears in southern Ontario and the southern tip of Quebec. The natural distribution of redcedar has been considerably extended, especially in the Great Plains, by natural regeneration from planted trees. Throughout its range it grows under diverse conditions—in deep and shallow soils, on ridgetops, and in bottom lands.

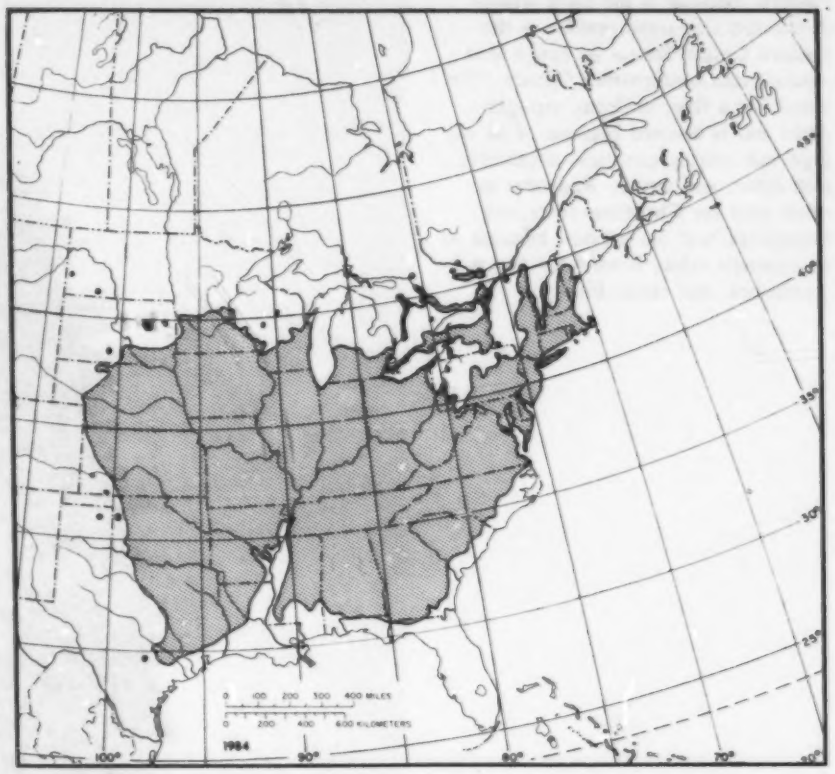

Figure 1—Natural range of eastern redcedar.

The magnificent stands so often mentioned by early explorers have been cut, and for years redcedar has been primarily confined to fence rows, abandoned fields, and submarginal lands, and growth is often slow. The species is so frequently associated with limestone ledges that it is commonly believed to grow only on dry, rocky soils. Such sites produce short-bole trees whose merchantable length rarely exceeds one or two 6.5-foot posts. Like most trees, eastern redcedar grows best on deep, moist, well-drained alluvial sites, where its height may reach 55 to 60 feet at 50 years of age. Because of competition from other species, however, it rarely becomes dominant on such sites.

Redcedar is among the first trees to invade abandoned fields, areas cleared for pasture, road rights-of-way, and some surface-mined areas. On deep soils, associated successional species, such as persimmon (*Diospyros virginiana*) and sassafras (*Sassafras albidum*), may crowd it out. Occasionally the species is found in almost pure stands on cedar glades. However, redcedar is most frequently associated with blackjack oak (*Quercus marilandica*), post oak (*Q. stellata*), winged elm (*Ulmus alata*), Ozark chinkapin (*Castanea ozarkensis*), fragrant sumac (*Rhus aromatica*), Carolina buckthorn (*Rhamnus caroliniana*), rusty blackhaw (*Viburnum rufidulum*), and Alabama supplejack (*Berchemia scandens*). In the southern half of the species range it is associated with shortleaf (*Pinus echinata*) and Virginia (*P. virginiana*) pines, and in the central zone with northern red oak (*Quercus rubra*), white oak (*Q. alba*), hickories (*Carya* spp.), black walnut (*Juglans nigra*), and other hardwoods.

Description and Growth

Eastern redcedar grows slowly, and a long rotation is required to produce conventional sawlogs. Trees 20 to 30 years old are generally 18 to 26 feet tall and 2.3 to 3.0 inches in diameter at breast height (4.5 feet). Mature trees are small to medium in size, usually 40 to 50 feet tall with a bole 12 to 24 inches in diameter. On a good site they may reach 120 feet in height and 48 inches in diameter. On a dry site, on the prairies, for example, trees 110 years old are generally less than 20 feet tall. Growth rates can be improved by removal of competing vegetation.

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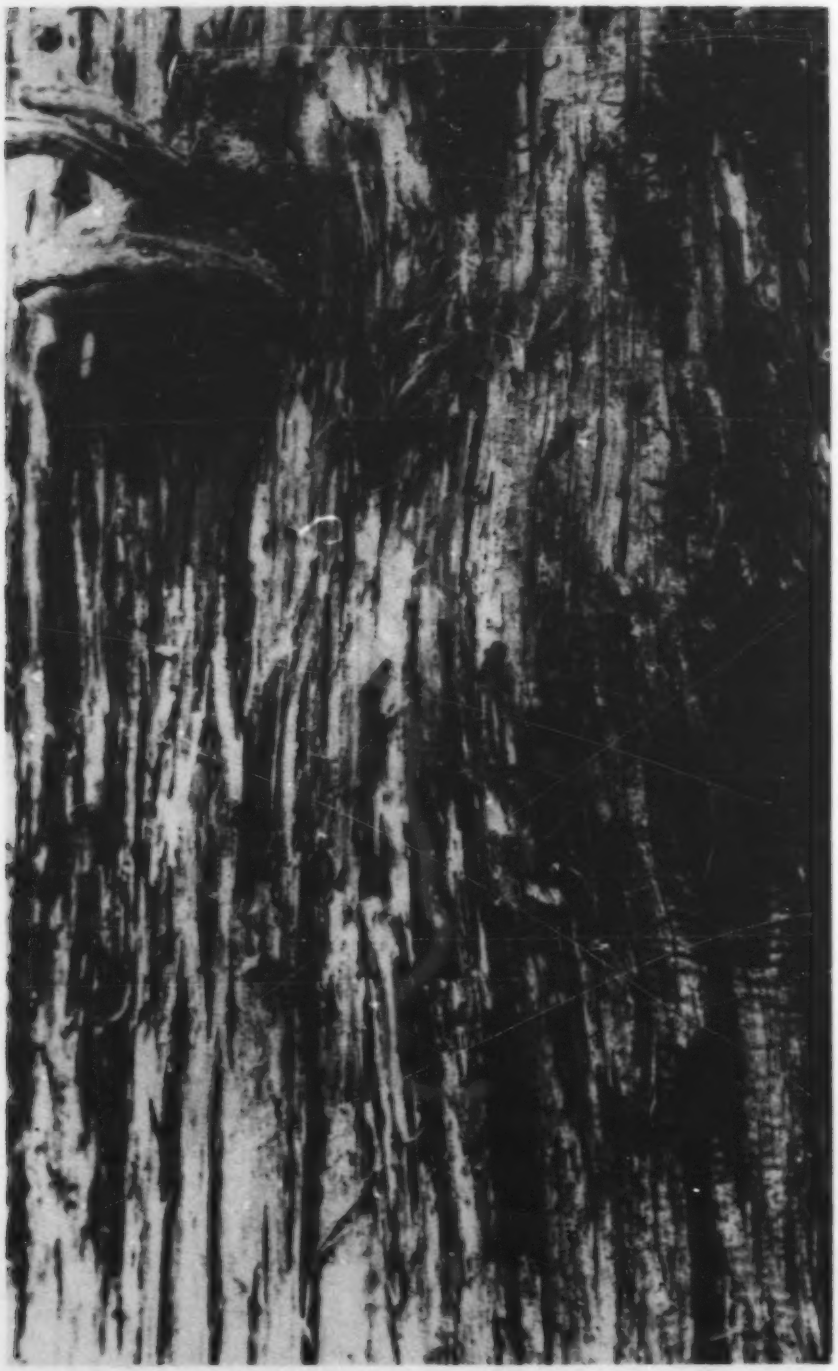

Figure 2—Bark of eastern redcedar and conk of cubical rot fungus, *Daedalea juniperina*, near branch stub.

The bark is very thin and peels in long, shreddy strips (fig. 2). Radial growth is extremely irregular, and the trunk may be fluted. The tree is variable in form; the crown may be columnar or pyramidal, with the branches ascending, wide-spreading, or even pendulous.

Tiny evergreen leaves are borne in two forms. Those on seedlings and vigorous twigs are sharp pointed, awl-shaped, and 0.50 to 0.75 inch long (fig. 3). On less vigorous stems, closely overlapping scalelike leaves fit tightly against the twig in opposite pairs. These scalelike leaves are usually about 0.06 inch long and dark blue green; they turn russet or yellow brown during the winter.

From February to May, small inconspicuous flowers appear at the ends of minute twigs; male and female flowers are almost always on separate trees. The small, pollen-bearing catkins often give the entire tree a golden color. The fruit is a fleshy, dark-blue, highly aromatic, berrylike cone (fig. 4). Trees are usually 10 years or older before they produce fruit. Cones mature in one season, and when ripe are purplish blue, covered with a white powdery or waxy bloom. They contain 2 (rarely 3 or 4) small seeds, 37,000 to 55,000 per pound, averaging 43,600 per pound of cleaned seed.

Good seed crops occur every 2 or 3 years, with light crops between. The seeds usually germinate in the spring of the second year after they mature, but a few germinate in the first and third years. Seeds are eaten in large quantities by birds and small mammals and thus dispersed. Passage through the digestive tract of a bird or other animal probably hastens germination.

Eastern redcedar does not reproduce naturally by sprouting or suckering. However, the species may be propagated by grafting or layering or from cuttings.

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The thin bark of eastern redcedar offers little protection against fire. Fortunately, the foliage does not burn readily, and in stands on shallow soils, litter accumulation is limited because trees are scattered and small. Thus, the lack of fuel helps protect many stands from fire damage. Herbs and native grasses are relatively abundant on cedar glades, which are commonly grazed. Overgrazing by livestock readily damages the shallow soils by increasing compaction, surface runoff, and erosion, as well as causing injury to the fibrous roots of redcedar, which grow close to the soil surface.

When deer feed heavily on the twigs and foliage, as sometimes happens during hard winters, browse lines develop on old trees, younger ones become cropped and hedge-shaped and most reproduction is destroyed. Livestock also cause browse lines on eastern redcedar if they are confined to areas that have little food supply. However, redcedar foliage is not among their preferred foods.

Eastern redcedar is very susceptible to damage by the annosus root rot fungus (*Heterobasidium annosum*). This disease is considered to be the species' greatest enemy over much of its range. Cubical rot fungi (*Fomes subroseus* and *Daedalea juniperina*) and the juniper pocket rot fungus (*F. juniperinus*) may enter redcedar stems through dead branch stubs; therefore, pruning is generally not recommended (fig. 2). In all stages of development, eastern redcedar is susceptible to cedar rusts caused by fungi in the genus *Gymnosporangium*. Spindle-shaped swellings on the trunks and large branches are one effect of the disease. Witches-broom growths, compact, bushy formations of the foliage, are also caused by a fungus in this genus. Although cedar apple rust fungus (*Gymnosporangium juniperi-virginianae*) infects redcedar, it is rarely fatal; however, this fungus is very damaging to apple trees and is difficult to control. In some States, eradication of all cedars and junipers

Figure 3—Awl-shaped leaves on a vigorous twig.

Figure 4—Redcedar fruit and scalelike leaves on a mature twig.

within a mile of an apple orchard is required by law. Redcedar seedlings are susceptible to phomopsis blight (*Phomopsis juniperovora*) and cercospora blight (*Cercospora sequoiae*). Both of these diseases can cause major seedling losses; however phomopsis blight is not serious after the fourth year.

Insects usually do not seriously damage eastern redcedar. Several boring insects feed on living and dead trees, and bagworms (*Thyridopteryx ephemeraeformis*) and spruce spider mites (*Oligonychus ununguis*) occasionally completely defoliate trees. Roots of seedlings are very susceptible to attack by nematodes and grubs. Several weevils, bark beetles, scale insects, and sawflies may also attack redcedar.

Common Names

Eastern redcedar is the commonly accepted name for this species. It has also been called cedar, redcedar, red juniper, Virginia juniper, and savin. Because of its reddish bark and wood, early French colonists called the tree *baton rouge*, meaning red stick.

Related Commercial Species

Eastern redcedar is usually marketed as a separate species because of its beauty, workability, durability, and pleasing odor. In resource estimates the species is sometimes included with eastern hemlock (*Tsuga canadensis*), eastern white pine (*Pinus strobus*), baldcypress (*Taxodium distichum*), Atlantic white-cedar (*Chamaecyparis thyoides*), the spruces (*Picea* spp.), and firs (*Abies* spp.), in an "other softwoods" grouping. Redcedar is not included with standard grades of pine lumber.

Supply

The growing stock and sawtimber volumes of eastern redcedar timber have increased during the last decade in

most States. Growing stock volume in the United States is estimated at 700 million cubic feet on commercial forest lands. Nearly half of this is located in the three States of Kentucky, Tennessee, and Arkansas. Missouri, Alabama, Virginia, South Carolina, and North Carolina each have more than 50 million cubic feet of growing stock volume.

Sawtimber-size trees make up more than 1 billion board feet, 37 percent of which is in Arkansas, Kentucky, and Missouri. Eastern redcedar volumes have reached nearly 100 million board feet in Tennessee, Alabama, South Carolina, and Mississippi and more than 75 million board feet in North Carolina and Virginia.

The eastern redcedar forest cover type extends over 1.5 million acres, much of which is in Tennessee and Kentucky, although Arkansas, Missouri, and Virginia also have substantial acreages. In addition there are nearly three-quarters of a million acres in the eastern redcedar–hardwood type, most of which is in Kentucky and Missouri.

Production

Production of eastern redcedar is frequently not reported or is combined with that of other softwood species. Conservatively, it is estimated that about 40 million board feet are harvested annually. In addition, about 15 million cubic feet of growing stock trees are removed each year, most of which is used for posts. These figures represent about 60 and 40 percent of the net annual growth of sawtimber and growing stock, respectively.

For a variety of reasons, many forest landowners harvest redcedar themselves. Their equipment is usually large enough to handle the typical logs, and posts from small trees are often utilized by the landowner. Volume of redcedar on most farm woodlots is not large enough to attract a logging contractor, but forest landowners can usually make a profit by doing their own logging. In harvesting, it is usually most profitable to cut as many sawlogs as possible, then convert the remaining material into posts.

Redcedar sawlogs are sometimes bucked into minimum lengths of 7 feet, but more commonly 8 feet, with a diameter inside bark of at least 5 inches at the small end. Trees are usually considered sawlog-size when their diameter at breast height is 6 inches or more. However, minimum diameter for sawtimber volumes in most forest resource inventories is 9 inches. Grade specifications permit sound knots and white streaks, but wood must be sound. Lumber grades are based on the proportion of a board that will yield sound cuttings, with certain limits of length, width, and proportion of sapwood. Variations in thickness are permitted, and odd lengths are admitted without limit. Round redcedar posts are usually 7 feet long at least 2.5 inches diameter inside the bark at the small end, and are cut from trees of at least 4 inches diameter at breast height.

Ashe juniper (*Juniperus ashei*) posts and other products are often marketed as eastern redcedar in the areas where the two species grow together, mostly in Texas and the Arkansas-Missouri Ozark Mountains.

Characteristics and Properties

Redcedar has thin, whitish sapwood and reddish or deep reddish-brown heartwood. The number of rings in the sapwood varies with tree age and growth rate; old, slow-growing trees may have 20 to 30 rings per inch while young, fast-growing trees may have 8 to 15 per inch.

The transition between the sapwood and heartwood is usually abrupt, but there may be a narrow pinkish fringe around the heartwood or occasional streaks of white sapwood alternating with heartwood. Although normally bright and attractive, the unfinished heartwood will darken when exposed to sunlight. Only a small part of the annual growth ring is composed of latewood.

The heartwood is highly resistant to decay and to attack from insects, including termites. Its aromatic property is often given credit for repelling clothes moths although there seems to be little scientific basis for this reputation.

The physical properties of redcedar wood are excellent for many uses. The wood is moderately low in strength and stiffness but high in shock resistance. It shrinks very little during drying and is not greatly affected by changes in atmospheric moisture. Thus, it stays in place well after seasoning. It is moderate in hardness, but still highly workable. The grain is straight, except when deflected by knots. Knots are harder than surrounding wood but usually are tight and add to the beauty of most finished products. The wood splits easily, holds nails reasonably well, and has excellent gluing characteristics. Because of its natural beauty most manufacturers merely apply a clear finish, which enhances the color and retards darkening. The wood is characterized by long thin tracheids, resinous parenchyma cells, and fine rays. The vertical tracheids in stemwood have tangential diameters of 15 to 20 micrometers and radial diameters of 14 to 28 micrometers. Vertical parenchyma cells are fairly abundant, sometimes occurring in bands, and are generally filled with dark resinous material. The exclusively parachymatous rays are two to four cells high in tangential view, rarely exceeding a height of six cells. The dark and conspicuous rays are about 9 to 11 micrometers wide. Resin ducts are absent in stemwood but are present in the primary bark.

Physical and mechanical properties of eastern redcedar wood may vary with local growing conditions. Its wood is moderately heavy, with a specific

gravity of about 0.44 based on green volume and ovendry weight, and a density of 33 lbs. per cubic foot at 12 percent moisture content. The lightest and softest wood comes from redcedar trees grown on swampy hummocks in the Southern States.

Compression tests parallel to the grain indicate that maximum crushing strength is about 3,570 pounds per square inch (p.s.i.) for green redcedar wood and 6,020 p.s.i. for wood at a standard 12-percent content. Compression perpendicular to grain or fiber stress at proportional limit is 700 p.s.i. for green wood and 920 p.s.i. for wood at 12-percent moisture content. Shear strength parallel to the grain is about 1,010 p.s.i. for green wood. The modulus of rupture of green wood is 7,000 p.s.i. and 8,800 p.s.i. for wood at the standard moisture content. The coefficients for radial and tangential dimensional changes due to shrinkage or swelling are 0.00106 and 0.00162 per 1 percent change in moisture content, respectively. These coefficients are valid for moisture contents of 6 to 14 percent.

Principal Uses

Because of its durability, redcedar has always been valued for fenceposts. Even today this use accounts for most of the wood harvested. Large numbers of young trees are cut for posts before they reach sawlog size.

Its alleged moth-repelling quality makes the wood popular for chests, wardrobes, and closet lining. For this purpose, the boards must be left unfinished so the cedar smell can be released.

Redcedar has largely been replaced by other species and wood substitutes in the manufacture of pencils. However, the demand for redcedar wood for carving and making pet bedding has increased substantially. Redcedar is also used in the manufacture of furniture, flooring, scientific instruments, novelties, small boats, and household items.

Oils distilled from leaves, twigs, and wood are used in the manufacture of perfumes and medicines. The most important oil is cedrol, which can be separated by fractionation into several aromatic compounds. Yield of oil from fresh chips and sawdust is 2 to 3.5 percent.

Eastern redcedar ranks among the top five trees used for Christmas trees. This use is very common in areas where it occurs abundantly in pastures and fence rows. Many varieties of eastern redcedar are used as ornamental plantings. Redcedar is an important constituent of shelterbelt plantings in the Great Plains. It also helps to prevent or reduce erosion in natural stands, especially on very shallow soils.

Eastern redcedar probably provides food and cover for more species of wildlife than any other tree. The fruits are food for birds, rabbits, foxes, racoons, skunks, opossums, coyotes, and other wildlife. The foliage and twigs are eaten by deer, and are an important source of food during winter when other green plants are scarce.

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